Before the
Federal Communications Commission
Washington D.C. 20554

In Re Petition of
The American Radio Relay League, Inc. RM-11325

Amendment of the Amateur Service Rules to
Facilitate the use of Spread Spectrum
Communications Technology

Via ECFS

EX PARTE COMMENTS
of
Robert A. Buaas, K6KGS

Background

Spread Spectrum (SS) in Amateur Radio had its genesis more than 25 years ago. The idea started with the pioneering work of the Amateur Radio Research And Development Corporation (AMRAD), to whom the first Special Temporary Authorization (STA) was granted in 1981 (see http://amrad.org/projects/ss). The work proceeded through the bulk of the 1980's and produced a Proceeding that added the original SS sections to Part 97 in 1985. Through the 1990's, I continued the work started within AMRAD, and later in the decade the Tucson Amateur Packet Radio Corporation (TAPR), with support from the Petitioner organization (ARRL), organized studies using, in part, products that came out of IEEE 802.11. See http://tapr.org/spread_spectrum.html for a comprehensive history of both STA's and the experimental results produced.

I am one of the participants in the original AMRAD STA. To continue studying SS modulation, I requested and was granted a subsequent STA. My team's contributions are documented as noted above as well as in the FCC's various proceedings over the years. Our experimental results were achieved largely by designing and building our own new equipment, and operating it in carefully controlled environments.

I had the privilege of being a charter member of the IEEE 802.11 committee that produced the now-popular "WiFi" system standards. I participated in the committee's work for a number of years, principally in the subgroups working on radio modulation selection and characterization.

I hold, together with esteemed colleague James Bertonis, US Patent 6,625,222, which uses spread spectrum coding principals in a novel commercial application.

Observations

The subject of this proceeding regards the Amateur Radio Service, a licensed radio service. The implications of the proposed change go far beyond any interference issues surfaced by commentators using Part-15 devices in one band used by Amateurs.

Spread Spectrum modulation properties are little understood in Amateur circles, particularly with regard to the potential for SS (and other complex digital modulations) to interfere with simpler (older) modulation modes. Our previous experiments conclusively established that properly designed SS systems were undetectable when sharing spectrum used by FM repeater operators. These results derived mostly from (1) that most multi-user FM systems, by their nature, operate well above the minimum transmit level needed for communicating with the nearest user, and (2) while the spectrum was fully (and often multiply) "allocated" to systems of users, the actual percentage of time an FM emission utilized each channel was so low that the SS energy was often the only occupier of the channel. While this model does not fully apply to users of weak-signal modulations, hybrids of SS modulations have been shown to effectively mitigate even these concerns.

There seems to be a common thread present in most of the comments recommending against adoption of the instant proposal. These commentators desire to maintain the status quo, which is to maintain at least equal footing with respect to perceived interference level increases. This derives from the misguided notion that existing systems are somehow not currently extremely vulnerable to already authorized emissions. Consider the impact of a kilowatt EME station (a high power narrowband emitter) on outdoor WiFi ("DSSS" with no significant process gain) operation. WiFi receivers with antennas pointed toward the EME station would likely see some impact if the separation were less than one mile (the "near-far" problem facing all broadband systems). Indoor WiFi systems further than a few hundred feet from the same EME station would escape any impact (WiFi, operating as it was designed to be, as a short-range radio system with high signal to noise or interference margins).

Advanced digital modulations (SS or otherwise) are extremely complicated methods. The hardware and software required to create these systems is generally well beyond the expertise and means of most Amateurs.

Nevertheless, one of the purposes of the Amateur Radio Service is to provide the vehicle whereby individuals use the privileges conferred by the license to advance the state of the radio art. Yet, Part 97 contains so many arbitrary restrictions and limitations that advancement is substantially prevented. Only when we had the freedom provided in the STAs were we able to make progress. Since the expiration of the last STA, little has been accomplished (the most notable exception is the OFDM used in narrowband HF, and even it is constrained by arbitrary bandwidth limitations). With the availability of low cost, high capacity Digital Signal Processor microcircuits, a Software Defined Radio is within reach. How it will be used will depend heavily on the restrictions contained in the Rules.

An example of one arbitrary and unnecessary restriction is the subject of this proceeding. Our objection, ten years ago, to the requirement for output power control is kindly noted in the petitioner's filing.

Recommendations

Adopt the Petitioner's proposal. In addition, go much further. Remove ALL the arbitrary restrictions and limitations regarding power, modulation, emission bandwidth, frequency allocation. Keep the specifications pertaining to maximum output power, band limits, "common sense" technical and operating requirements (e.g., use only the amount of power required). Provide only the broadest guidance. One result would be that any modulation would be permitted anywhere inside any Amateur Band (including HF), leaving the details of subdivision (if any) to the Amateur community itself. Just because Amateurs would have the freedom to do "anything they want" does not necessarily mean that they will!

Phil Karn, KA9Q, had the courage to recommend permitting SS at HF and VHF ten years ago. That recommendation is every bit as valid today as then; my feeling is that, with the availability of today's DSP, we should not limit ourselves to only SS. WiFi modulations now bear only passing resemblance to the SS originally envisioned when IEEE 802.11 began.

Handle inter-service interference issues separately. The priorities for licensed vs. non-licensed operation are well established in the Rules. If the public good dictates, alter the Rules. But, proceed with caution.

Respectfully Submitted,

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